AD

LABORATORY REPORT No. 291

NUTRITION SURVEY: RANGER DEPARTMENT FORT BENNING, GEORGIA

28 JANUARY, 1966

US ARMY MEDICAL RESEARCH AND NUTRITION LABORATORY

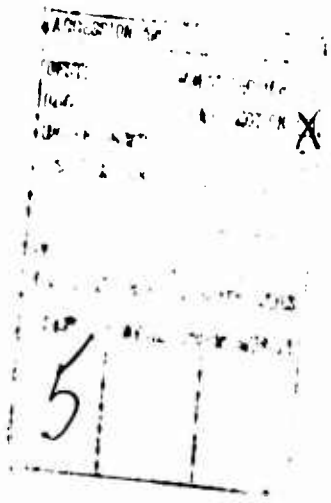
FITZSIMONS GENERAL HOSPITAL
DENVER, COLORADO 80240

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED.

REPRODUCTION OF THIS DOCUMENT IN WHOLE OR IN PART IS PROHIBITED EXCEPT WITH THE PERMISSION OF U. S. ARMY MEDICAL RESEARCH AND NUTRITION LABORATORY, FITZSIMONS GENERAL HOSPITAL, DENVER, COLORADO 80240. HOWEVER, DDC IS AUTHORIZED TO REPRODUCE THE DOCUMENT FOR UNITED STATES GOVERNMENT PURPOSES.

DESTROY THIS REPORT WHEN NO LONGER NEEDED. DO NOT RETURN IT TO THE ORIGINATOR.

THE FINDINGS IN THIS REPORT ARE NOT TO BE CONSTRUED AS AN OFFICIAL DEPARTMENT OF THE ARMY POSITION, UNLESS SO DESIGNATED BY OTHER AUTHORIZED DOCUMENTS.



U. S. ARMY MEDICAL RESEARCH AND NUTRITION LABORATORY
FITZSIMONS GENERAL HOSPITAL
DENVER, COLORADO 80240

LABORATORY
REPORT NO. 291

28 January 1966

Project Number: 3A25601A822 Military Internal Medicine

Task Number: 02 Internal Medicine

Work Unit No.: 073 Applied Nutrition Studies of Military Populations

NUTRITION SURVEY: RANGER DEPARTMENT FORT BENNING, GEORGIA

By
C. Frank Consolazio
Le Roy O. Matoush
Richard A. Nelson
Bioenergetics Division

Richard S. Harding
Chemistry Division

and

John E. Canham, Lt. Colonel, MC*
Metabolic Division
US Army Medical Research and Nutrition Laboratory

*Presently Commander US Army Medical Research and Nutrition Laboratory

FOREWORD

The Surgeon General, Department of the Army, requested by letter dated 8 June 1962, that the US Army Medical Research and Nutrition Laboratory, Fitzsimons General Hospital, Denver, Colorado 80240, conduct nutrition surveys on representative samples of US Army personnel to provide information necessary for execution of his responsibilities under AR 40-5. In addition, in a letter dated 24 April 1964, the USAMRNL was directed to investigate a request from the Ranger Department, US Army Infantry School, Fort Benning, Georgia, for an increase of 30% in rations.

We wish to thank Colonel Jesse L. Morrow, Jr., Inf. and Colonel Irwin A. Edwards, Inf., the former and new commanding officers of the Ranger Department and their staff for their wonderful cooperation during the study. We especially wish to thank Major Charles W. Elliott, Inf. of the Ranger Department and Captain Thomas A. Davenport, Inf., commanding officer, 44th Company, 4th Student Battalion TSB for their great assistance. Last, but not least, our sincere thanks to Captain Robert M. Brumback, Inf. of the Ranger Department, to whom we owe a great debt of gratitude. This study would never have been accomplished, without his assistance.

Our sincere thanks to members of USAMRNL for their technical assistance during this study. They include SP5 Ted A. Daws, SP5 Teddy G. Johnson, SP5 John L. Deffenbaugh, PFC Graydon A. Grey, SP4 John J. Bertucelli, and SP4 Michael L. Cummins.

SUMMARY

Laboratory Report No. 291
Project No. 3A025601A822 4 Military Internal Medicine
Task No. 02 - Internal Medicine
Work Unit No. 073 - Applied Nutrition Studies of Military Populations

OBJECT

The primary purpose of this study was to conduct a nutrition survey on a representative sample of US Army Personnel, and to provide information necessary for execution of AMEDS responsibilities under AR 40-5. In addition, information was gathered for the Chief of Nutrition Branch, Preventive Medicine Division, OTSG to evaluate whether a requested 30% increase in rations for the Ranger Department should be authorized.

SUMMARY

AR 40-5 prescribes the minimal nutrient intake of a physically active individual living in a temperate environment and subsisting on a garrison or field type ration to be 3600 Calories/man/day. The daily food consumption of the Ranger Department, trainees, Fort Benning, Georgia over the entire training period, using the chemical analyses of the food composites, averaged 4400 Calories or an increase of 22.2% over the daily prescribed intakes. When one utilizes the caloric equivalent of the body weight change (-70 gm/man/day or 442 Calories) the energy requirement averaged 4842 Calories/man/day. This was equivalent to an increase of 34.5% over the prescribed daily minimal intake.

This fairly high requirement was not unexpected since the men worked long hours, especially during the field training phase, and were under stress imposed by continuous physical and mental pressure.

TABLE OF CONTENTS

BODY OF REPORT

WORK UNIT NO. 073 Applied Nutrition Studies of Military Populations

Nutrition Survey: Ranger Department, Fort Benning, Georgia

PROBLEM

The Surgeon General requested, by letter dated 8 June 1962, that the US Army Medical Research and Nutrition Laboratory, Fitzsimons General Hospital, Denver, Colorado 80240, conduct nutrition surveys on representative samples of US Army Personnel to provide information necessary for execution of his responsibilities under AR 40-5.

BACKGROUND

"Due to changing needs of the military, there is a continuing necessity to evaluate the capability of current and newly developed rations (both freshly prepared and as altered by varied storage conditions) to provide adequate nutrition to the soldier under a variety of duty requirements and environmental situations. The nutritional basis of our present ration system is adequate for garrison training duty on a current basis but may not be optimum for the total military life of the soldier. Longitudinal evaluations of the nutritional status, the body composition and the work performance and capacity of the soldier is essential to insure that the effective military performance of the soldier, during his duty career, is not impaired by improper nutrition. Such impairment could limit the capability of the Army's cadre at a time when instant readiness is mandatory. Previous studies, though helpful, provide only some of the necessary answers."

Recently the 44th Company, 4th Student Battalion, Student Brigade, Fort Benning, Georgia requested authorization for a 30% increase in the daily garrison ration. It was the feeling of the Commanding Officer at the Ranger Department, Fort Benning, Georgia, that this request was justified because of the weight loss observed during the three week Ranger training cycle conducted at Fort Benning. The Ranger trainees averaged 14.5 hours/day of the most strenuous peace time military training. This training includes extensive bayonet drills, confidence and obstacle courses, night patrols and physical conditioning (Appendix I).

In a preliminary study at Fort Benning, Georgia in August-September 1964, body weights were taken 4 times by USAMRNL personnel during the 3 weeks Ranger training cycle. It was observed that the 159 men in the company lost approximately 1.82 kg (4.0 lbs) during the entire training period. A complete study was conducted in November-December 1964 that served a twofold purpose; (a) to further investigate the request from the Ranger

Department, US Army Infantry School for additional rations, and (b) to perform a nutrition survey to evaluate the adequacy of the nutritional intake of men performing the most strenuous of military training.

APPROACH TO THE PROBLEM

The request for additional rations was evaluated by measuring the energy balance of the men during the entire training period. The daily energy output was estimated by the use of time motion studies, and the subsequent measurement of the energy cost of the specific physical activity tasks. Direct measurements of energy expenditure during specific training phases, which were difficult to reproduce in the home laboratory, were obtained utilizing the Muller-Franz respirometer.

Interest existed for the interrelationships between dietary intake, energy output, body weight changes, skinfold measurements, work performance, and selected biochemical data. Specific interest also concerned the lung compartment size, smoking habits, age, body composition and work performance.

The study was conducted for a 3 week period at the Ranger Department, Fort Benning, Georgia. The subjects (approximately 135 men began the study; there were 38 dropouts) included the complete mixed officer and enlisted men's class in training during 27 November - 20 December 1964. A brief history was taken on each man to include, age, rank, military occupation, race, length of service, area of origin, smoking habits, drinking habits, history of recent illnesses or chronic diseases, and family history of obesity, heart disease, diabetes or hypertension.

The students were made available two days prior to the beginning of the Ranger course for the bicycle performance test, spirometry, blood drawing, urine collection, etc.

Dietary Evaluation of Food Intake

1. The accurate measurement of all food served and the various food wastes (plate, kitchen, and preparation) was done during a 15 day period.

2. Accurate head counts were taken at each meal.

3. Food intake was estimated using standard tables of food composition (USDA Handbook No. 8) (1) and was determined by chemical analysis of food composites. The food composites were analyzed for protein, fat, moisture, and ash. Carbohydrate was calculated by difference.

4. Information gathered also included the quantity of food consumed between meals from sources outside the regular messing area. These areas include snack bars, PX's, etc.

5. Information was also gathered on the daily food issues, food preparation, food wastes, food acceptability, milk consumption and the distribution of the protein, fat, and carbohydrate calories consumed.

6. The adequacy of the diet was determined daily for the 15 day period using both the chemically analyzed values and the calculations based on the standard tables of food composition.

Body Weights and Heights

Body heights were measured (to the nearest 0.5 centimeter) on each man, at the beginning of the training period. Body weights were determined to the nearest 20 grams three times during the entire study. Each man was weighed in the nude immediately after voiding upon arising, at the beginning of the study, at 8 days, and at the end of the December phase of the training cycle (Day 18).

Biochemical Determinations

Bloods: A 20 ml heparinized fasting blood was drawn at the beginning and end of the study on every 4th man, for hemoglobin, hematocrit, osmolarity and plasma protein. These determinations were used as a measurement of hydration or dehydration of the test subjects.

Urines: One hour fasting urines were taken on each man at 3 intervals during the study, at the beginning, during the middle of training, and at the end. Total solids and specific gravity, using the micro refractometer (2), were measured on each sample. The urines were preserved at a pH of 2.0 and frozen until shipped to USAMRNL in Denver.

Skinfold Thickness Measurements

Skinfold thickness measurements at 4 sites were taken on every 4th man in the class, at the beginning, and at the end of the training period, using the Lange calipers. Measurements were done in duplicate utilizing bilateral subscapular sites and the skin of the dorsum of both arms.

Bicycle Performance

A maximal bicycle performance test, based on the Balke treadmill technique, was performed on every 4th man (same men as for bloods), at the beginning and the end of the study. Total riding time, total wattage, maximal pulse during exercise and recovery pulses were obtained for Physical Fitness Index (PFI) scoring (recovery pulses were taken at 1.0 - 1.5, 2.0 - 2.5, and 4.0 - 4.5 minutes after exercise) (3).

Each individual rode the bicycle ergometer at a low rate of energy expenditure for one minute, followed by gradually increasing the work load in each succeeding one-half minute (60 to 260 watts) in 10 watt increments each 30 seconds, until the man stopped due to exhaustion. Pulse rates were not a factor for discontinuing the maximal performance test.

Energy Expenditure

One member of the USAMRNL testing team was constantly assigned to the Ranger trainees during the training cycle for time motion studies to estimate the daily energy expenditure. In addition, metabolic rate measurements for energy costs were done on many of the various physical activity tasks performed during training, using the M-F metabolimeters. The respiratory gas samples were analyzed for oxygen and carbon dioxide and total respiratory volume; RQ and oxygen consumption were subsequently calculated. Daily energy balance was computed (energy intake versus energy output).

Lung Compartment Measurements

These measurements were taken at rest both before and after the study on every 4th man and included a 1-2 second timed vital capacity, maximum breathing capacity, and maximum breath holding.

RESULTS

Mess hall food consumption/man/day, utilizing values calculated from the standard food tables, averaged 3746 Calories for the 8 day preliminary phase in camp, and 4336 Calories during the field phase, with an overall average of 4021 Calories during the entire training period. When one considers the food consumed from sources outside the mess hall, the total food intake averaged 4061, 4559, and 4293 Calories/man/day for the same respective periods (Tables I and II).

For comparison, the food consumption, determined by chemical analyses of the food composites, showed the daily food intake from the mess hall alone to average 3944, 4348, and 4133 Calories/man/day for the preliminary camp phase, the field phase, and the combined phases (Table III). The calculated average from sources outside the mess hall increased the intakes by 315, 223, and 272 Calories/man/day for a total intake of 4259, 4571, and 4405 Calories/man/day for the same respective periods (Table I).

A breakdown of the various food items consumed in gm/man/day, during the entire study, is shown in Table IV. For example the men consumed an average of 1378 gm of milk, 30 gm of butter, 87 gm of eggs, 90 gm of bread, 58 gm of sugar, and 150 gm of potatoes/day. Plate waste (edible) by individual items, served during the entire study, are tabulated in Table Va. Plate waste, during the entire study, averaged 8.5% for all the vegetables served, 4.4% for meats, 8.0% for breads and cereals, 6.3% for salads and dressings, 1.1% for fruits, 10.7% for soups, 1.5% for dairy products, and 4.8% for desserts (Table Vb). Kitchen waste (edible) items averaged over the entire study are presented in total quantity discarded, and in percentage of the total quantity issued (Table Vb, c). These values averaged 13.6% for vegetables, 8.1% for meats, 6.4% for soups, 3.4% for breads and cereals,

2.5% for dairy products, and 16.7% for salads and dressings. The total edible waste averaged 22.1% for vegetables, meats 12.0%, soups 17.1%, fruits 1.3%, desserts 5.4%, cereals and breads 11.4%, dairy products 4.0%, and salads with dressings 25.0% of the total offered (Table Vb). The average plate waste of all the items was 4.0%, the kitchen waste averaged 4.4%, with an overall average of 8.4% edible waste (Table Vb).

The daily energy expenditure estimated from time motion studies and energy cost data for the daily physical activities, are presented in Table VI. The daily expenditure/man/day averaged 4128 Calories for the 8 day camp period, 4369 Calories for the 8 day field phase, and 4249 Calories for the entire training period. The lowest daily expenditure was recorded on Day 15 (3251 Calories), and the highest on Day 11 (5633 Calories). Energy cost, in Calories/kg/10 minutes and Calories/minute for a 75 kg representative man, of the various military activities, used to calculate the daily energy expenditure, is presented in Appendix II.

Body weight changes showed a slight increase during the camp period, averaging +0.13 kg for 8 days for Platoons I and II, and +0.60 kg for 4 days for Platoon III. There was an appreciable decrease during the field phase averaging -1.53, and -1.01 kg for the same respective groups. The total body weight loss for the entire training period averaged -1.40, and -0.41 kg for the same groups. The total body weight loss for all men (based on the total number of days) averaged -1.15 kg, or -70.1 gm/man/day (Table VII).

Blood samples were drawn on approximately 35 men before and after the training period. Hemoglobins were unchanged averaging 14.68 before and 14.68 gm/100 ml after the training period. The blood hematocrits were slightly decreased (by 0.60%), averaging 46.5% before, and 45.9% after the training phase. The plasma proteins were significantly decreased by 0.50 gm/100 ml ($P < 0.001$) averaging 7.93 gm before, and 7.43 gm after the training periods (Table VIII). The timed fasting urinary excretion data showed the specific gravities to be practically unchanged (1.029, 1.031 and 1.029), and the total solids to be increased during the camp phase and decreased during the field phase, averaging 7.33, 7.67, and 7.18 gm/100 ml (Table IX).

Waist circumference and skinfold thickness measurements were also taken before and after training on 35 men. The body waist measurements were significantly decreased by 2.76 cm ($P < 0.001$) at the end of the training period. Three of the 4 skinfold measurements were not significantly different, but for no apparent reason the right subscapular skinfold was significantly increased by 0.32 mm ($P < 0.025$) (Table X).

A maximum performance test was performed on the bicycle ergometer, before and after the training period, on a limited number of men. Even though the maximum performance time was decreased from 10.54 to 9.83 minutes, the physical fitness index scores were increased from 66 to 73. This was due to the decreased recovery pulses at the end of the training period (Table XI).

Lung compartment and other measurements (BTPS) were determined before and after the training phase. Following the training cycle the forced vital capacity was decreased by 114 ml, the maximum breathing capacity was lowered by 26 liters/minute, the maximum breath holding decreased by 9 seconds, and the hand grip, using a dynamometer, by 6.5 kg (Table XII).

A summary of the daily food intake, energy expenditure and energy balance information is presented in Table XIII. The energy balance, using the food intake data from the chemical analyses of the food composites and the estimated energy expenditures showed the men to be in a positive balance of +151 Calories/man/day, during the entire training phase. The estimated daily requirements, using the food intake from all sources and the caloric equivalent of the body weight losses, averaged 4842 Calories/man/day (Table XIV).

DISCUSSION

There was fairly close agreement in the two methods for measuring caloric intake from the mess hall. The calculated values were 112 Calories/man/day less than the values determined from the chemical analyses of the food composites. The food consumed from sources outside the military mess hall averaged 272 Calories/man/day, increasing the total daily food consumption to 4293, and 4405 Calories/man/day. The total food consumed from outside sources, which consisted primarily of candy bars, was fairly low in comparison to other American military nutrition studies. In the combined Army camp studies, published in 1959 (4) this intake averaged 727 Calories/man/day in 4 army camps; and in the Fort Carson, Colorado study the average was 566 Calories/man/day (5). On the other hand, in an ad libitum food intake study on military troops (6), the food consumed from sources outside the mess hall averaged only 152 Calories during a 4 week period.

The distribution of Calories from the nutrients consumed averaged 14.9% from protein, 38.8% from fat, and 46.3% from carbohydrate, for the two methods of measuring food consumption. As in the other studies, the chemical analyses of the food composites for fat were low in comparison to the values calculated from the standard food tables. This results in an apparent high carbohydrate intake, because it is calculated by difference after determining the fat and protein intake. The high fat intake in the American dietary is not unusual. In the camp study (4), the fat intake averaged 45.1%; in the recent Fort Carson study (5), the fat intake in three separate units averaged 42.9%; and in the ad libitum food intake study (6) the fat intake provided 39.8% of the total calories consumed.

The NRC's Committee on Dietary Allowances (7) has recommended a daily allowance of 1 gm of protein/kg of body weight. No recommended allowances for fat or carbohydrate intakes are available, because only limited data are available on a reasonable fat allowance and the characteristics of a mixture of fatty acids that would be most favorable to promote good health. It is the general feeling that the macronutrient distribution of food calories is a matter of economics, food habits, and preparation. The population of the United States is accustomed to a high fat intake because of relatively high socioeconomic level. In countries of lower economic level the trend is toward a diet high in carbohydrate, and low in fat. Rice and wheat products are relatively inexpensive, and are the main food items in these countries. Regardless of the environmental temperature and humidity the distributions of protein, fat, and carbohydrate calories in the diet appear to be relatively constant (8).

AR 40-5 prescribes the Army basic minimal caloric intake to be 3600 Calories/man/day, for a physically active soldier living in a temperate environment (9). One must remember that these standards were prepared to serve as a guide in planning adequate menus for the young healthy soldier. Dietary requirements are increased or decreased depending on many factors, such as age, body weight, physical activity, and environmental temperature. The Master Menu, which is a guide and is the basis of military feeding, normally prescribes an excess of calories ranging from 4000 to 4200 Calories/man/day throughout the year. The menu is calculated to yield at least 3600 edible Calories, after one deducts for the 400-600 edible Calories lost in plate and kitchen wastes.

The troops gained body weight during the first phase of the study (Days 1-8), which was due to the long hours of sedentary activity, due to the lectures, demonstrations, etc., in preparation for the field phase. In the 8 day field phase, the body weight loss was more than 1 kg, even though the food intake increased to 4571 Calories/man/day. The total weight loss for the complete 18 days averaged -1.15 kg or -70 gm/man/day.

Even though the hemoglobin values were unchanged during the complete training phase, the hematocrits were decreased by 0.60%. However, this change was not significant. Plasma proteins were decreased by 0.5 gm% during the training period. This change was highly significant with a P value of <0.001. The decrease in the plasma proteins could be indicative of retention of body water, however, other factors could be responsible for the decrease in plasma proteins. Nevertheless, it is felt that it can be unequivocally stated that no dehydration was present at the time this study was concluded, and that the weight loss observed was not due to loss of body water. Mean body waist circumference decreased by 2.8 cm during the course of the training period. This is probably an indication of the loss of body fat, but could be indicative of increased tonus of the abdominal musculature secondary to the physical training.

The estimated daily energy expenditure averaged 4249 Calories/man/day for the entire training period, which was lower than the average daily intake of 4404 Calories. The values for energy expenditure for the various daily activities may be greatly underestimated due to multiple factors. For one, the estimated energy expenditure figures are based upon time motion studies during which one, and sometimes two men tried to monitor the activities of the entire training company consisting of 97 men. Limitation of research personnel did not permit more close monitoring of the entire group. However, it is felt that the values obtained by this technique should give average values, but under certain circumstances one would expect to miss minor activities, which, over an 18 day period, could influence the total expenditure of energy. During the field phase of the training cycle the trainees slept outdoors with only two blankets and a poncho supplied to each man. No sleeping bags were available. Some of the days were quite cold and wet, and practically every evening, the temperature was below freezing. Therefore, the value utilized to estimate basal metabolic rate may have been an error due to increased expenditure to maintain body temperature. In addition, it was impossible to estimate the increased energy expenditure, due to the stress imposed by continuous harassment both physical and mental during the training cycle.

As mentioned previously, AR 40-5 (9) prescribes the minimal nutrient intake/man/day of a physically active individual living in a temperate environment and subsisting on a garrison or field type ration to be 3600 Calories/day. Based upon the observed data in this study, an attempt has been made to more closely pinpoint the average daily caloric intake necessary to supply the energy requirements of the men undergoing the Ranger Training Cycle. The caloric equivalent of the mean body weight loss of 1.15 kg amounted to 442 Calories/day. The daily food consumption over the entire training period, using the chemical analyses of the food composites, averaged 4404 Calories/man/day, or an increase of 22.2% over the daily prescribed intakes. When one utilizes the caloric equivalent of the body weight change, the energy requirements averaged 4846 Calories/man/day. This was equivalent to an increase of 34.5% over the prescribed daily minimal intakes. It may be assumed that the caloric value of the food intake should equal at least the values for the energy expenditure imposed by the conditions of training.

During this study, the daily food intake and the edible wastes (plate and kitchen) averaged considerably more than was issued and prescribed by the Master Menu. This extra food came from many sources including (a) an additional 10% increase in the daily ration during the Fort Benning phase of the Ranger training, (b) large quantities of surplus butter and cooking fats, (c) large quantities of fresh milk, and (d) the continuous borrowing of food from other mess halls.

Milk consumption, which averaged 1378 gm/man/day, was higher than the recent camp study at Fort Carson, where the average in three military units was 1150 gm/day. In the ad libitum food intake study (6), the milk consumption averaged 1537 gm/day. The high milk consumption was not unexpected since milk is available ad libitum in all the military messes.

The total edible food waste of 8.4% observed in this study was considerably lower than the 14.8% waste observed in the Army camp study (4). The plate waste averaged only 4.0% which was less than one-half of the 8.6% observed in the Fort Carson survey (5). There is no question that the men were consuming practically all of their food from the mess hall and very little from outside sources. The troops worked long hours, were very tired, and were not able, or did not have the desire to procure food items at the PX's or snack bars.

In general, the troops seemed to be fairly well conditioned by the end of the study. Even though the maximal work time on the bicycle ergometer was significantly decreased at the end of training, the physical fitness index scores were significantly increased from 66 to 73. This was due to the significant reduction in the post-exercise pulse rates ($P < 0.001$).

The forced vital capacities at the end of training were not significantly different, although maximal breathing capacity, maximal breath holding, and the right and left hand grip measurements were all significantly decreased on the last day of training ($P < 0.05$, $P < 0.001$, and $P < 0.001$). These significant decreases may have been due to the men being extremely tired on the last day. On this particular day, the men were awakened at 1:30 a.m., and were taken on a 16 mile forced march immediately before performance of the above tests. In addition, each man had to perform (or drop out of the course) the final confidence course activities.

RECOMMENDATIONS

If an increase in rations is authorized, it must be specified that it will be for the students and the training cadre. It should not be used for the supporting party. Both of these groups now eat together.

OBSERVATIONS

1. Food preparation, even though it had improved considerably during our stay, according to the cadre and supporting personnel, still left a lot to be desired. The troops in training constantly complained of the poor food preparation, of it being too greasy, etc. They wanted "quality not quantity".

2. The daily rations (meat, vegetables, etc.) issued at the military mess, were never checked or weighed by the kitchen personnel. The quantities were taken for granted.

3. Even though bread was brought in daily, the cooks (bakers) did all the baking of rolls and pastry. This seemed to be a waste of manpower.

BIBLIOGRAPHY

1. Watt, B. K. and Merrill, A. L.: Composition of Foods. Revised. Agriculture Handbook No. 8, Agricultural Research Service, US Department of Agriculture, Washington, D. C. 1963.

2. American Optical Company: Total Solids Meter (A Goldberg Refractometer). Buffalo 15, New York.

3. Consolazio, C. F., Johnson, R. E. and Pecora, L. J.: Physiological Measurements of Metabolic Function in Man. McGraw-Hill Publishing Company, Blakiston Division, New York, N. Y., 1963.

4. Consolazio, C. F., Hawkins, J. M., Johnson, O. C. and Friedemann, T. E.: Energy Requirements of Military Personnel During Basic Training. US Armed Forces Medical Journal 10: 1133-1142, 1959.

5. Staff of USAMRNL: Fort Carson, Colorado Nutrition Survey, October 1963.

6. Konishi, F., Hawkins, J. M., Berger, F. M., Isaac, G. J. and Friedemann, T. E.: The Dietary Composition and Adequacy of the Food Consumed by Young Men on an Ad Libitum Regimen. J. Nutrition 63: 41-56, 1957.

7. National Academy of Sciences, National Research Council: Recommended Dietary Allowances. 6th Revised Edition, 1964. A Report of the Food and Nutrition Board, Publication No. 1146, Washington, D. C.

8. Consolazio, C. Frank: Caloric Requirements of Long Flights. Conference on Nutrition in Space and Related Waste Problems. NASA SP-70, 1964.

9. AR 40-5, Section 6, Nutrition, 25 April 1963.

Table I

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Food Consumption, Average/Man/Day
Calculated Values, Using Standard Food Tables

Days of Study In Mess Hall	Cal	Prot gm	Fat gm	CHO gm	Calc mg	Iron mg	Vit A I.U.	Vit B_1 mg	Vit B_2 mg	Niacin mg	Vit C mg
1	4165	170.7	179.2	450.6	2221	23.2	9328	2.01	5.29	19.0	174
2	3685	119.6	159.8	459.6	1963	17.1	8971	2.06	3.61	16.8	135
3	4026	172.7	186.5	389.0	1905	22.3	7130	2.50	3.76	22.7	125
4	3586	134.0	194.7	344.0	1611	17.6	7227	1.53	3.07	16.4	155
5	3701	147.8	164.9	396.4	2084	15.8	8202	2.00	4.05	27.6	109
6	3637	149.9	195.3	306.2	2490	21.8	4849	2.54	3.79	28.2	101
7	3114	108.9	159.6	310.7	1880	13.9	4664	1.33	2.92	14.7	122
8	4053	141.7	178.6	443.7	2072	19.1	6028	2.48	3.99	25.6	188
Mean	3746	143.2	177.3	388.0	2028	18.9	7062	2.06	3.81	21.4	139
9	4056	146.5	186.7	446.9	2431	22.6	12405	2.32	6.72	25.6	118
10	4256	134.3	215.9	396.5	2389	19.7	9239	2.02	4.53	23.8	125
11	4526	175.8	223.1	447.5	2695	19.9	7822	3.97	4.49	24.5	138
12	4388	181.7	228.7	409.8	3110	19.5	8802	3.05	5.08	15.4	109
13	4827	169.2	255.0	469.6	2582	20.7	9261	2.89	4.93	23.2	238
14	4306	161.0	230.3	397.3	2468	20.9	9926	2.18	4.70	23.9	97
15	3992	150.4	179.4	438.4	2139	16.9	6688	2.36	3.88	19.3	127
Mean	4336	160.0	217.0	429.4	2688	20.0	9163	2.68	4.90	22.2	136
Mean All	4021	150.9	195.8	407.3	2269	19.4	8703	2.35	4.32	21.8	137

Table II

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Food Consumption, All Sources
Average/Man/Period, Calculated Values

Days of Study	Cal	Prot gm	Fat gm	CHO gm	Calc mg	Iron mg	Vit A I.U.	Vit B_1 mg	Vit B_2 mg	Niacin mg	Vit C mg
1 - 8											
Mess Hall	3746	143.2	177.3	388.0	2028	18.9	7062	2.06	3.81	21.4	139
Outside Mess	315	9.7	14.5	39.5							
Total	4061	152.9	191.8	427.5							
9 - 15											
Mess Hall	4336	160.0	217.0	429.4	2688	20.0	9163	2.68	4.90	22.2	136
Outside Mess	223	9.7	10.2	30.7							
Total	4559	169.7	227.2	460.1							
1 - 15											
Mess Hall	4021	151.6	195.8	407.7	2336	19.4	8042	2.35	4.32	21.8	138
Outside Mess	272	9.7	12.5	35.4							
Total	4293	161.3	207.3	442.7							

Table IIIa

FORT BENNING, GEORGIA RANGERS STUDY - 1964
Food Consumption, Chemical Analyses of Food Composites
Average/Man/Day (Mess Hall Alone)

	Days							
	1	2	3	4	5	6	7	8
Calories	4480	4000	3764	3910	3703	3992	3706	4000
Protein, gm	142.3	125.6	154.3	147.0	168.6	158.5	116.8	147.9
Fat, gm	196.8	126.5	121.3	189.7	104.6	154.7	130.7	131.9
Carbohydrate, gm	535.0	590.0	514.0	403.5	522.0	491.0	516.0	555.0

	Days						
	9	10	11	12	13	14	15
Calories	4418	4285	4058	4734	4372	4576	3992
Protein, gm	149.5	159.2	164.0	181.3	166.3	174.2	143.8
Fat, gm	169.3	164.3	135.3	178.3	159.0	198.1	140.3
Carbohydrate, gm	574.0	542.5	546.0	601.0	569.0	524.0	538.5

Means	Days 1 - 8	Days 9 - 15	Days 1 - 15
Calories	3944	4348	4133
Protein, gm	145.1	162.6	153.3
Fat, gm	144.5	163.5	153.4
Carbohydrate, gm	515.8	556.4	534.8

Table IIIb

FORT BENNING, GEORGIA RANGER STUDY - 1964

Per Cent Distribution of Total Calories Consumed

	Protein	Fat	Carbohydrate
Calculated	15.0	43.8	41.2
Analyzed	14.8	33.9	51.3
Mean	14.9	38.8	46.3

Table IV

FORT BENNING, GEORGIA RANGER STUDY - 1964

Food Intake of Various Food Items
Mean/Man/Day During a 15 Day Period

Food Item	gm/Man/Day	Food Item	gm/Man/Day
Dairy Products			
Milk	1378	Noodles	10
Butter	30	Griddle Cakes	5
Evaporated Milk	42		
Ice Cream	51	Sugar	58
Cheese	2	Jelly	15
Cottage Cheese	4	Syrup	6
Eggs	87	Cranberry Sauce	1
Meats		**Fats**	
Hamburgers	21	Mayonnaise	3
Ham	13	Shortening	2
Corned Beef	8	Bacon Fat	3
Beef Steak	32	Salad Dressing	13
Roast Beef	14	Gravy	25
Ground Beef	10	1000 Island Dressing	1
Pork Butts	12	Russian Dressing	2
Cold Cuts	9	Fruit Dressing	1
Frankfurters	6	**Desserts**	
Chicken	19	Apple Pie	20
Turkey	4	Peach Pie	13
Liver	4	Cherry Pie	13
Pork Sausage	6	Cherry Crisp	12
Shrimp	7	Banana Cream Pie	12
Fish	10	Lemon Meringue Pie	13
Bacon	14	Devil's Food Cake	12
Meat Sauce	9	Gingerbread	9
New England Boiled Dinner	7	Short Cake	4
Creamed Beef	9	Brownies	3
Beef Stew	5	Cookies	4
Turkey a la King	13	Cake with Icing	14
Chop Suey	14	Coffee Cake	6
		Cinnamon Rolls	5
Cereal, Bread		Bread Pudding	8
Bread	90	Butterscotch Pudding	10
Cereal, Dry	18		
Flour	59		
Rice	13		
Spaghetti	27		
Biscuits	44		
Corn Bread	4		
Cereal, Hot	45		

Table IV (cont.)

Food Item	gm/Man/Day	Food Item	gm/Man/Day
Vegetables		**Sauces**	
Potatoes	150	Vanilla	2
Succotash	8	Mustard	1
Peas	12	Tartar	4
Green Beans	12		
Wax Beans	2	**Soups**	
Brussel Sprouts	3	Chicken Soup	8
Cabbage	6	Turkey Rice Soup	5
Spinach	7	Onion Soup	5
Celery	3	Bean	1
Carrots	6	Tomato	2
Cole Slaw	6		
Lettuce	17	**Salads**	
Broccoli	5	Pear Salad	7
Tomatoes, Escalloped	5	Waldorf Salad	7
Squash	2	Chef's Salad	2
Cauliflower	1		
Lima Beans	3		
Green Peppers	1		
Corn, Creamed	5		
Corn, Buttered	6		
Baked Beans	28		
Fruits			
Oranges	47		
Tangerines	6		
Apples	21		
Bananas	34		
Grapes	6		
Grapefruit	6		
Peaches	12		
Pineapple	8		
Cherries	13		
Pears	18		
Strawberries	4		
Fruit Salad	17		
Orange Juice	17		
Tomato Juice	17		
Pineapple Juice	0.3		
Cherry Juice	1.4		
Prunes	1		
Jello	7		

Table Va

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Plate Waste - Per Cent Loss During 15 Days

Food	Served kg	Plate Waste kg	Per Cent Waste
Vegetables			
Peas	37.12	2.17	5.8
Cabbage	10.11	1.66	1.6
Corn, Creamed	9.11	1.33	14.6
Corn, Buttered	12.52	0.41	3.3
Carrots	10.17	0.90	0.9
Lima Beans	14.49	3.13	21.6
Squash	5.50	1.41	25.6
Broccoli	11.04	1.43	13.0
Succotash	19.93	2.05	10.3
Beans, Wax	4.27	0.43	10.1
Brussel Sprouts	6.97	0.82	11.8
Green Beans	48.71	3.07	6.3
Cauliflower	2.93	0.42	14.3
Lettuce	69.89	11.39	16.3
Cole Slaw	25.75	2.37	9.2
Spinach	29.07	2.81	10.0
Potatoes	463.92	30.61	6.6
Beans, Baked	68.31	5.79	8.4
Escalloped Tomatoes	13.64	1.64	12.0
Sugars			
Jelly - Jams	37.19	3.74	10.1
Syrup	15.17	0.00	0.0
Tartar Sauce	3.90	0.39	10.0
Meats			
Pork Sausage	25.31	0.20	0.8
Bacon	25.98	1.18	4.5
Beef Steak	111.05	0.00	0.0
Ham	32.91	1.25	3.8
Hamburger	34.58	0.32	0.9
Roast Beef	18.27	1.77	10.2
Meat Ball	20.41	1.84	9.5
Meat Loaf	18.76	0.07	0.4
Liver	15.00	0.99	6.6
Corned Beef	19.83	4.22	21.3
Spareribs	41.55	0.00	0.0

Table Va(cont.)

Food	Served kg	Plate Waste kg	Per Cent Waste
Chicken	76.84	0.00	0.0
Shrimp	22.67	2.07	9.1
Pork Chops	39.54	0.00	0.0
Creamed Beef	33.28	5.72	17.1
Beef Stew	18.15	1.52	8.4
New England Boiled Dinner	18.15	1.00	5.5
Turkey a la King	41.24	3.00	7.3
Cold Cuts	21.30	1.38	6.5
Chop Suey	40.74	2.11	5.2
Fish	16.93	0.40	2.4
Franks	11.41	0.89	7.9
Beef Fricassee	45.68	3.26	7.1
Meat Sauce	33.49	0.40	1.2
Soup	323.04	34.46	10.7
Fruits			
Pears	52.33	0.78	1.5
Apples	26.83	0.00	0.0
Tangerines	40.90	0.00	0.0
Oranges	107.69	0.00	0.0
Bananas	102.98	0.00	0.0
Pineapple	17.00	0.00	0.0
Fruit Salad	33.91	2.22	6.5
Strawberries	11.55	0.00	0.0
Grapefruit	7.84	0.28	3.6
Grapes	2.03	0.00	0.0
Tomato Juice	25.53	0.35	1.4
Orange Juice	65.92	0.89	1.4
Cranberry Sauce	2.17	0.18	8.3
Apple Sauce	14.27	0.86	6.0
Cereals, Breads			
Noodles	24.43	1.74	7.1
Corn Bread	11.68	1.43	12.2
Hot Rolls	118.60	8.28	7.0
Spaghetti	87.00	7.12	8.2
Corn Meal Mush	14.48	0.00	0.0
Rice	32.35	1.37	4.2
Pancakes	12.11	1.05	8.7
Cereal, Dry	37.56	2.06	5.5
Cereal, Hot	70.84	13.17	18.6
Bread	197.02	12.35	6.8

Table Va(Cont.)

Food	Served kg	Plate Waste kg	Per Cent Waste
Dairy Products			
Milk	3011.31	38.36	1.3
Butter	79.41	5.09	6.4
Cottage Cheese	9.90	0.35	3.5
Cheese, Provolone	8.37	0.36	4.3
Ice Cream	75.59	0.45	0.6
Eggs	199.45	7.50	3.8
Salads			
Chef's Salad	6.24	1.20	19.2
Cabbage Salad	5.67	0.98	17.2
Vegetable Salad	4.87	0.40	8.2
Waldorf Salad	14.38	1.23	8.6
Green Bean and Onion Salad	23.52	4.86	20.9
Peas and Celery Salad	8.37	0.47	5.6
Bell Pepper and Celery Salad	6.57	0.65	9.9
Potato Salad	14.57	5.36	36.8
Cottage Cheese Salad	10.79	1.25	11.5
Desserts			
Lemon Pie	30.16	0.48	1.6
Banana Pie	24.21	0.24	1.0
Cherry Pie	33.24	0.31	0.9
Apple Pie	58.88	2.25	3.8
Peach Pie	31.66	2.02	6.5
Cherry Crisp	22.00	2.14	9.7
Cake, Coffee	73.16	7.22	9.9
Cookies	7.73	0.11	1.4
Brownies	9.99	0.16	1.6
Shortcake	10.18	0.84	8.3
Gingerbread w/Lemon Sauce	17.79	0.20	1.1
Devil's Food Cake	17.58	0.52	3.0
Bread Pudding	14.35	1.58	11.0
Cinnamon Rolls	11.71	0.36	3.1
Peach Jello	13.02	0.69	5.3
Butterscotch Pudding	17.24	0.42	2.5
French Toast	25.33	0.59	2.3

Table Vb

FORT BENNING, GEORGIA RANGER STUDY - 1964

Total Edible Wastes, kg and Per Cent Loss by Food Groups*

Food	Plate Waste			Kitchen Waste		Total Edible Waste	
	Served kg	Waste kg	% of Total Served	Waste kg	% of Total Served	kg	%
Vegetables	863.5	73.8	8.5	136.4	13.6	210.2	22.1
Sugars	52.4	3.7	7.1	0.0	0.0	3.7	7.1
Meats, Fish Poultry	783.1	33.6	4.4	68.8	8.1	102.4	12.0
Soups	323.0	34.5	10.7	22.1	6.4	56.6	17.1
Fruits	511.0	5.6	1.1	1.0	0.2	6.6	1.3
Desserts	418.2	20.1	4.8	2.4	0.6	22.5	5.4
Cereals, Breads	606.1	48.6	8.0	21.4	3.4	70.0	11.4
Dairy Products	3384.0	52.1	1.5	8.3	2.5	60.4	4.0
Salads, Dressings	260.4	16.4	6.3	59.9	18.7	76.3	25.0
Miscellaneous	3.9	0.4	10.0	0.0	0.0	0.4	10.0
Average of All			4.0		4.4		8.4

* Totals for entire study.

Table Vc

FORT BENNING, GEORGIA RANGER STUDY - 1964

Kitchen Waste, kg and Percentage of Totals Served

Food Item	Waste kg	Waste %	Food Item	Waste kg	Waste %
Meats			**Dressings, Etc.**		
Liver	6.45	30.1	Bacon Drippings	1.38	12.3
Spareribs w/Sc	7.55	15.4	Gravy	25.52	29.0
Creamed Beef	12.39	27.1	Salad Dressing	8.06	23.3
Chicken Fricassee	6.68	12.8	Russian Dressing	0.82	15.6
Turkey a la King	20.30	33.0	Fruit Dressing	2.36	68.3
Meat Balls	1.50	6.8	Mustard Dressing	0.59	17.1
Meat Sauce	1.25	3.6	Italian Dressing	0.67	18.1
NE Boiled Dinner	12.66	41.0	Mayonnaise	4.47	68.8
			Vanilla Sauce	6.05	74.7
Breads, Cereals					
Corn Bread	1.70	12.7	**Vegetables**		
Noodles	2.32	8.7	Potatoes	78.61	14.5
Griddle Cakes	0.99	7.6	Spinach	14.37	13.1
Hot Rolls	10.35	8.0	Succotash	11.53	16.6
Spaghetti	6.07	6.5	Cauliflower	4.36	10.0
			Broccoli	7.03	19.0
Soups			Corn	4.13	16.6
Knickerbocker	1.40	3.8	Green Beans	6.37	2.6
Chicken	11.22	9.7	Lettuce	6.99	9.1
Turkey Rice	1.60	5.3	Escalloped Tomatoes	1.04	7.1
Beef Vegetable	3.19	4.1	Baked Beans	1.97	2.8
Bean	4.65	61.6			
			Miscellaneous		
Salads			Eggs	8.34	4.2
Chef's	3.20	34.0	Butterscotch Pudding	2.39	12.2
Cabbage	3.04	35.0	Orange Juice	1.00	1.5
Vegetable	1.13	18.8			
Bean and Onion	2.60	9.9			

Table VI

FORT BENNING, GEORGIA RANGER STUDY - 1964

Physical Activity Schedule - Day 1
(Time Motion Data - Beginning at 2100 Hours)

Activity	Time in Minutes	Calories/Time
Sleeping	484	624.0
Personal Toilet	45	97.0
Lying on Ground (No Sleep)	30	49.5
P. T. Exercises	15	94.7
Horisontal Bars	2	22.8
Standing Outside Normally	160	255.6
Standing Outside, Formation	15	40.0
Running, One Mile	7	299.4
Running, Double Time	25	515.0
Sitting, Lectures	75	142.5
Sitting Normally	173	236.2
Walking Normally	140	557.0
Walking, 120 Paces/Minute	26	295.9
Crawling 40 Yards	2	15.2
Swimming 50 Meters	3	37.2
Meals	95	150.3
Kneeling	15	20.4
Cleaning Barracks	60	249.0
Cleaning Equipment	35	118.6
Bus Riding	33	62.7
Totals	1440	3878

Table VI (cont.)
Physical Activity Schedule - Day 2

Activity	Time in Minutes	Calories/Time
Sleeping	420	542.0
Personal Toilet	45	97.0
P. T. Exercises	25	157.8
Rope Climb, Confidence Ladder	2	22.8
Standing Outside Normally	220	351.5
Standing Outside, Formation	20	53.4
Run 1.5 Miles (26 Out)	8	342.1
Meals	75	118.7
Bus Ride	37	70.3
Swim, 80 Meters w/Clothes, Rifle Web, Equipment	4	161.5
Run, Back and Forth, etc. Double Time	24	494.4
Sitting Normally	250	341.3
Kneeling	20	27.1
Lying Down, Resting	65	107.2
Hand to Hand Combat, Practice Falls, Throws, etc.	65	492.5
Marching, 0.2 Miles	4	21.9
Cleaning Barracks, Equipment	60	226.2
Walking Normally	96	382.0
Totals	1440	3991

Table VI (cont.)
Physical Activity Schedule - Day 3

Activity	Time in Minutes	Calories/Time
Sleeping	405	522.0
Personal Toilet	45	94.0
P. T. Exercises	18	113.6
Standing Outside Normally	145	231.7
Standing Outside, Formation	9	24.4
Run 1.5 Miles (40 Dropouts)	7.5	320.7
Run Double Time	16	329.6
Rope Climb, Confidence Ladder	1.5	17.1
Meals	75	118.7
Moving Equipment in Barracks	40	218.1
Bus Rides	61	112.2
Getting Equipment, Walking, Standing	69	219.4
Walk w/Duffle Bag, 200 Yards	2	13.2
Map Reading, Lecture, Sitting	280	532.1
Other Sitting, Resting	38	51.9
Walking During Rest Periods	82	326.3
Kneeling	10	13.6
Lying Down, Resting	75	123.4
Marching	1	5.5
Cleaning Barracks	30	124.5
Cleaning Equipment, Etc.	30	101.7
Totals	1440	3614

Table VI (cont.)
Physical Activity Schedule - Day 4

Activity	Time in Minutes	Calories/Time
Sleeping	405	522.0
Personal Toilet	45	94.0
Lying on Ground (No Sleep)	30	49.5
P. T. Exercises	18	113.7
Rope Climbing, Confidence	4	45.6
Standing Outside Normally	80	127.8
Standing Outside w/Equipment and Rifle	40	74.0
Standing Outside, Formation	10	26.6
Running, Double Time	54	1113.0
Sitting, Lectures, Demonstrations	226	430.0
Sitting Normally	66	90.2
Walking, Normally	60	239.0
Walking 120 Paces/Minute	32	189.0
Meals	100	158.0
Marching	83	454.0
Equipment Inspection	25	72.0
Cleaning Barracks	30	124.6
Cleaning Equipment	62	211.0
Bus Riding	70	128.8
Totals	1440	4263

Table VI (cont.)
Physical Activity Schedule - Day 5

Activity	Time in Minutes	Calories/Time
Sleeping	339	437.0
Personal Toilet	50	104.0
Lying on Ground, No Sleep	15	25.0
P. T. Exercises	15	94.7
Horizontal Bars	2	22.8
Rope Climbing, Confidence Ladder	2	22.8
Standing Outside Normally	107	171.0
Standing Outside, Formation	10	26.8
Running Double Time	45	927.0
Sitting, Lectures	174	330.6
Sitting, Normally	20	27.3
Sitting in Bunkers	114	216.6
Walking Normally	112	445.6
Walking 2.5 mph	95	714.0
Meals	109	172.5
Marching	3	16.4
Inspection	59	94.3
Cleaning Barracks	35	145.2
Cleaning Equipment	60	203.4
Bus Riding	74	136.2
Totals	1440	4337

Table VI (cont.)
Physical Activity Schedule - Day 6

Activity	Time in Minutes	Calories/Time
Foot Inspection	30	53.4
Cleaning Equipment, Etc.	30	101.7
Sleep (6.5 Hours)	390	503.0
Personal Toilet	60	125.0
Formation	33	88.1
Double Timing	19	391.4
Eating - 3 Meals	120	190.0
Riding Truck	38	69.9
Sitting (Lecture)	24	45.6
Sitting Throughout Day	82	112.5
Washing Clothes	20	72.8
Running	5	276.6
Standing Casually	52	83.1
Walking Casually	94	403.0
Pushups - 20	1	11.0
Exercise - Hand to Hand Combat	70	496.3
Lying Down, Rest Periods	52	85.8
Walking Through Woods, Etc. - Patrols	300	1950.0
P.T. Exercise	15	94.8
Totals	1440	5154

Table VI (Cont.)
Physical Activity Schedule - Day 7 (Sunday AM Off)

Activity	Time in Minutes	Calories/Time
Walking, Patrols	120	780.0
Sitting, Etc., Driving Patrols	200	430.3
Bus Ride	11	20.9
Sleep	420	542.0
Relaxing Leisurely (Sunday AM Off)	44	62.3
Double Time	5	133.1
Washing Clothes	20	72.8
Standing Casually	45	72.0
Eating, Sitting	105	166.2
Class Lectures, Sitti	70	133.1
Walking Casually	28	111.5
Walking w/Rifle	10	40.4
Formation	22	58.7
Obstacle Course	10	82.2
Bayonet Drill	10	129.6
Personal Toilet	45	104.0
Sitting	60	106.0
Sitting Casually	120	164.3
Resting, Lying Down, Etc.	45	68.3
(Men off at 5 p.m. - time approximated until 9 p.m.)		
Cleaning Equipment, Etc.	60	203.3
Totals	1440	3460

Table VI (cont.)
Physical Activity Schedule - Day 8

Activity	Time in Minutes	Calories/Time
Sleep	419	540.0
Personal Toilet	25	52.0
Cleaning Barracks	88	364.3
Sitting, Eating	17	26.9
Standing, Eating	80	144.4
Double Time	10	206.2
Washing Clothes	20	72.8
Standing, Formation	25	66.7
Marching	15	81.7
Walking Casually	20	85.4
Standing Casually	22	35.1
Sitting in Truck, Riding	26	47.8
Sitting in Class	284	539.4
Walking w/Equipment	10	53.3
Walking w/o Equipment	10	42.7
Standing w/Equipment	25	44.2
Standing w/o Equipment	76	179.5
Resting, Sitting, Lying Down, Etc.	38	57.5
Practice Applying Bayonet	54	697.3
Confidence Course, Double Time Between Obstacles	60	775.1
Cleaning Equipment, Relaxing, Etc.	55	186.5
Sleep	60	74.8
Totals	1440	4330

Table VI (cont.)
Physical Activity Schedule - Day 9

Activity	Time in Minutes	Calories/Time
Resting, Relaxing, Sitting, etc. Before Bedtime	60	94.4
Sleep*	420	594.5
Personal Toilet	45	104.0
Eating	103	163.0
Lectures, Classroom	349	663.2
Standing, Walking Leisurely Between Classes	69	183.7
Break, Unroll Bedroll, Etc.	44	309.2
Break, Roll up Bedroll, Etc.	24	168.6
Light Activity After Lunch	33	77.7
Formation	10	26.9
Walking Leisurely, Etc.	40	159.0
Running, Double Time	6	248.4
Bayonet Drill, Strenuous Exercise	15	193.8
Cleaning Equipment, Area	60	248.9
Sitting, Standing, Walking, Leisurely	60	160.0
Sleep (to 9 p.m. Bed at 1838 hrs)	70	98.0
Washing Clothes	20	72.8
Totals	1440	3568

* Assumed a 10% increase in MR during sleep due to cold for all days in the field (Days 9 - 15).

Table VI (cont.)
Physical Activity Schedule - Day 10

Activity	Time in Minutes	Calories/Time
Sleep 8.5 hours	510	722.4
Personal Toilet	30	62.4
Eating Breakfast	25	87.1
Standing, Walking, Leisurely	81	215.1
Classroom, Sitting	252	478.9
Walking w/Full Field Equipment and Bed Roll	16	85.3
Class, Breaks, (Sitting, Standing)	21	31.3
Standing in Line, Drawing Equipment	10	26.6
Marching to Chow	2	10.9
Walking Leisurely	22	86.0
Standing and Eating	58	97.7
Walking on Patrol	140	897.0
Walking, Sitting, Etc. Leisurely	196	521.9
Cleaning Equipment	28	94.9
Walking Briskly	5	20.5
Walking, Standing, Sitting Leisurely	34	90.5
Running	2	82.6
Totals	1440	3667

Table VI (cont.)
Physical Activity Schedule - Day 11

Activity	Time in Minutes	Calories/Time
Sitting	90	123.1
Marching - 2400 Meters	46	251.6
Walking, Etc.	10	40.7
Standing, Turning in Equipment	15	24.0
Preparation for Bed	25	59.7
Sleeping (0030 - 0500)	270	382.5
Dressing and Working on Equipment	45	152.5
Standing Eating	45	78.9
Working on Equipment	45	152.5
Briefing, Sitting	80	152.0
Patrol Tactics, Walking, Etc. w/Equipment - Heavy Work	270	1755.0
Eating	65	103.0
Patrol Tactics, Walking, Etc. Not Too Hard	200	1000.0
Walking Patrol in Swamps	44	293.0
Patrol Tactics, Walking, Climbing, Kneeling, Low Crawl, Etc. w/Equipment	150	1000.0
Standing Leisurely	40	63.9
Totals	1440	5633

Table VI (cont.)
Physical Activity Schedule - Day 12

Activity	Time in Minutes	Calories/Time
Patrolling, Walking, Etc.	66	429.0
Kneeling, Crawling, Crouching, Etc.	34	241.0
Briefing, Sitting	35	62.3
Checking and Cleaning Equipment	44	182.0
Eating - Soup	12	19.0
Sleep	300	425.0
Personal Toilet	20	42.0
Breakfast - 0550-0650 hrs	60	94.9
Sitting Leisurely	20	27.4
Sitting, Classroom	200	380.0
Breaks Between Classes, Standing, Lying Down, Resting	118	245.8
Walking Leisurely	25	99.5
Standing Leisurely	45	72.0
Lunch and Supper	80	126.6
Running w/Equipment	2	150.8
Ambush Tactics, Walking, Etc.	100	709.3
Truck and Bus Ride, Sitting	55	104.5
Bayonet Assault - Very Strenuous	30	389.0
Obstacle Course 6 Times - Heavy Work 4' Barricade, Run % Grade 400 Units, Back Crawl 25 Meters	80	1036.4
Clean Up, Etc.	10	41.6
Lying Down, Relaxing	40	66.0
Sleep - to 9 p.m.	60	85.2
Totals	1440	5030

Table VI (cont.)
Physical Activity Schedule - Day 13

Activity	Time in Minutes	Calories/Time
Sleep - 7.5 hours	450	637.2
Personal Toilet	30	62.4
Breakfast	60	94.9
Briefing, Classroom, Sitting	60	114.0
0700 - 1100 Released to Company Area Shower, Clean Up, Cleaning Equipment, Etc. Sitting Leisurely	120	164.2
Working on Equipment	120	406.7
Lunch	60	94.9
Walked 2.5 Miles w/Equipment	102	809.4
Sitting Leisurely	32	43.7
Standing Leisurely	48	76.7
Lying Down, Leisurely	28	46.3
Supper	60	94.9
Walking, Sitting Leisurely	30	128.2
Standing Leisurely	30	47.9
Bus Ride	30	56.9
To 9 p.m. Night Recon. Patrol	180	1170.0
Totals	1440	4048

Table VI (cont.)
Physical Activity Schedule - Day 14

Activity	Time in Minutes	Calories/Time
Patrol	180	1170.0
Bus Ride	30	57.0
Sitting Leisurely	40	54.7
Night Recon. Patrol	150	975.0
Sleep - Up at 6:45 a.m.	185	262.2
Off from 0800 - 1200 hours, Cleaning Gear, Sitting, Etc.		
Cleaning Equipment	62	210.0
Personal Toilet	43	89.4
Standing Eating	105	189.6
Standing Leisurely	27	43.1
Walking Leisurely	13	55.5
Miscellaneous Work on Equipment	187	633.3
Standing, Working on Equipment	120	282.3
Walking Leisurely	40	159.2
Sitting Leisurely	80	109.3
Marching	3	16.5
Double Timing Through Confidence Course, Running, Climbing, Etc. w/Rifle	10	283.3
Day Ended at 1645 hours		
To Bed Sleep 1815 - 2100 hours	165	233.4
Totals	1440	4820

Table VI (cont.)
Physical Activity Schedule - Day 15

Activity	Time in Minutes	Calories/Time
Sleep - 9 p.m.	520	738.0
Personal Toilet	31	64.5
Breakfast	35	55.4
Classroom, Sitting	247	469.4
Walking Leisurely	30	119.4
Standing Leisurely	27	43.2
Breaks Between Classes, Walking, Standing, Lying Down	37	105.4
Working Out System for Aircraft Drop	25	131.0
Marching	26	143.3
L[illegible]	39	61.7
[illegible]eisurely	21	95.3
At Ease	18	30.0
Ly. [illegible]round Leisurely	21	31.9
Walki[illegible] Obstacle Course	31	124.0
Obsta[illegible]le Course	12	117.1
Cleaning Equipment	60	249.6
Policing Area	35	159.2
Eating, Standing	36	65.0
Light Activity, Standing, Walking Slowly, Clean Up, Cleaning Equipment, Etc.	94	340.0
To Bed Sleep to 9 p.m.	105	149.2
Totals	1440	3251

Table VI (cont.)
Physical Activity Schedule - Day 16

Activity	Time in Minutes	Calories/Time
Sleep 2100 - 0145 Hours	285	403.9
Personal Toilet	15	31.7
Walked 16.4 Miles, Forced, w/Full Equipment	244	1908.0
Completed 0644 hours, 10 Minute Breaks (4)	40	124.0
Foot Inspection	30	53.4
Breakfast	30	47.5
Confidence Course	15	123.3
Sitting on Bleachers, Waiting for Turn	150	265.6
Lunch	60	94.9
Bicycle Maximum Performance Test	15	607.1
Walking Leisurely	30	119.4
Sitting in Laboratory	30	40.4
Formation	15	43.3
Standing Leisurely	62	99.2
Walking, Lying Down, Relaxing	60	150.0
Preparing Equipment for Turn In	60	203.3
Supper	60	94.9
Light Activity	74	175.7
Clean Up	45	186.4
Sleep to 9 p. m.	120	164.5
Totals	1440	4936

Table VII

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Body Weight Changes, kg/Period

	Platoons I and II	Platoon* III
Number of Men	76	21
Number of Days	18	13
Body Weight, Before	77.33	73.18
Body Weight, Day 9	77.46	73.78 (4 das)
Body Weight, After	75.93	72.77
Body Weight, Change	-1.40	-0.41
Mean Body Weight Loss, All Men	-70.1 gm/Man/Day	

* This group did not begin the study until the 5th day of training.

Table VIII

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Blood Changes, Mean/Group/Period*

	No. of Men	Before Study	S.D.	After End of Study	S.D.
Hemoglobin, gm/ 100 ml	28	14.68	0.559	14.68	0.566
Hematocrit %	29	46.46	1.84	45.86	1.99
Plasma Protein, gm/100	34	7.93	0.30	7.43	0.27

* Significance of data before and after study.

Hemoglobin	Not Significant
Hematocrit	Not Significant
Plasma Protein	$P < 0.001$, Highly Significant

Table IX

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Urinary Excretion Data
Mean/Group/Period

Day	Specific Gravity	Total Solids gm %
Day 1	1.029	7.33
Day 9	1.031	7.67
Day 16, End	1.029	7.18

Table X

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Skinfold Thickness and Waist Circumference Measurements
Mean/Group/Period

	Before		After		
	Mean	S.D.	Mean	S.D.	Significance
Waist Circumference, cm	78.60	4.79	75.84	4.05	$P<0.001$
Skinfolds					
Right Arm, mm	10.38	4.09	10.63	4.49	N.S.
Left Arm, mm	10.02	4.41	10.48	4.42	N.S.
ght Scapula, mm	9.41	3.01	9.73	2.95	$P<0.025$
Left Scapula, mm	9.57	3.00	9.98	3.05	N.S.

Table XI

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Bicycle Performance Test
Mean/Group/Period

	Before		After		Significance
	Mean	S. D.	Mean	S. D.	
Maximum Performance					
Time	10.54	1.88	9.83	1.89	$P<0.025$
Watt/Minute Work,					
Total	1703		1537		
Recovery Pulses X 2					
1 - 1.5	143	13.1	129	17.1	$P<0.001$
2 - 2.5	129	12.6	114	13.7	$P<0.001$
4 - 4.5	116	9.7	101	10.1	$P<0.001$
Physical Fitness					
Index	66	13.3	73	14.4	$P<0.010$

Table XII

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Spirometry and Miscellaneous Data
Mean of Each Group/Period

	Before		After		Significance
	Mean	S.D.	Mean	S.D.	
Forced Vital Capacity, ml	5603	670	5497	662	N.S.
FEV_1 % of FVC	83.6		82.0		N.S.
FEV_2 % of FVC	93.9		94.1		N.S.
FEV_3 % of FVC	97.3		97.6		N.S.
Maximum Breathing Capacity, liters	215	73.8	189	32.7	$P<0.05$
Maximum Breath Holding, Seconds	55	16.9	48	16.5	$P<0.001$
Grip, Right Hand, kg	48	7.8	42	8.6	$P<0.001$
Grip, Left Hand, kg	46	8.3	39	8.3	$P<0.001$

Table XIII

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Summary Food Intake and Energy Expenditure

Days	Food Intake Calories/Man/Day*		Estimated Energy Expenditure Calories/Man/Day	Balance
	Calculated	Analyzed		
1	4480	4795	3878	
2	4000	4315	3991	
3	4341	4069	3614	
4	3901	4225	4263	
5	4016	4018	4337	
6	3952	4307	5154	
7	3429	4021	3460	
8	4368	4315	4330	
Mean	4061	4258	4128	+128
9	4269	4641	3568	
10	4479	4508	3667	
11	4749	4281	5633	
12	4611	4957	5030	
13	5050	4595	4048	
14	4529	4799	4620	
15	4215	4215	3251	
16	-	-	4936	
Mean	4559	4571	4369	+202
Mean All	4293	4404	4249	+155

* Food intake from all sources

Table XIV

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Energy Balance, Calories/Man/Day

	Days		
	1 - 8	9 - 16	1 - 16
Food Intake, All Sources *	4256	4571	4404
Energy Expenditure**	4128	4369	4249
Balance	+128	+202	+155

* Using chemically analyzed food composite values.

** Energy expenditure estimated from time motion data. Values for energy cost of various activities may be greatly underestimated. During Bivouac the evenings were down to freezing (no sleeping bags) and no estimate was included for the continuous harassment and mental stress during training.

Table XV

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Estimated Energy Requirement During Training

Estimation from Body Weight Changes	Calories/Man/Day
Food Intake, All Sources, Cal/Day	4404
Body Weight Change: -1.15 kg or -70 gm/Man/Day	
Body Weight Caloric Equivalent (6.3 Cal/gm)	442
Requirement for Body Weight Change Alone*	4846

* Based on body weight changes alone, assuming the same proportion of protein, fat and water being lost.

APPENDIX 1

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Ranger Department Training Schedule

29 Nov AM (Sunday) - Physical Combat Proficiency Tests, Swimming, etc.
PM OFF until next AM
30 Nov AM PE, Inspections, Combat water survival tests
PM Fundamentals and Theory of Map Reading (3 hrs)
Hand to Hand Combat, Demonstration, Training, etc. (1 hr)
1 Dec AM PE, Lectures, Demonstrations
PM Lectures, Demonstrations
2 Dec AM PE, Inspections, Demonstrations, Lectures, etc.
PM Demonstrations, Lectures
3 Dec AM PE, Inspections, Demonstrations, Lectures
PM Ranger Demolition
Night Navigation until 2230 hours.
4 Dec AM PE, Hand to Hand Combat
1000 - 1700 hours, Day Off
5 Dec AM PE, Map Reading
PM Hand to Hand Combat Exercise
1520 - 2400 hours, Compass Course (Field Problem)
6 Dec AM(Sunday) - OFF
PM Obstacle Course, Bayonet Drill, etc.
Off at 1700 hours
7 Dec AM Lectures, Demonstrations
PM To 1515 hours Demonstrations
Bayonet Drill, Conditioning Course (2 hours)
8 Dec AM Techniques of Patrolling
PM Principles of Actions at the Objectives } - Lectures
Bayonet Drill (50 minutes)
9 Dec AM-PM - Lectures to 1700 hours
1900 hours, Patrolling Techniques, Night Combat
10 Dec Strenuous Day (in mud) Full Field Equipment, Patrol Tactics
11 Dec Fairly easy, Tactical Survival
Bayonet Assault Drills, Obstacle Course (110 min)
12 Dec AM Perfecting Patrol Techniques (Walking, not strenuous)
PM Night Reconnaissance Patrol (fairly strenuous) (8 hours)

Appendix I (cont.)

13 Dec	AM	(Sunday) - Sat around cleaning equipment
	PM	Conditioning Course (1 hour)
		To bed early
14 Dec	AM	Aerial Resupply and Heliocopter Terminal Guidance
	PM	Training Summary
		Obstacle Course (12 minutes)
		To bed early
15 Dec		Up at 1:30 AM
		16 mile Forced March to 0700 hours
		Final Confidence Course
		END

APPENDIX II

FORT BENNING, GEORGIA RANGERS STUDY - 1964

Physical Activities, Energy Expenditure*

Activities	Cal/kg/10 Min
Sleeping	0.172
Eating, Sitting	0.204
Eating, Standing	0.230
Lying Down, Resting (Breaks)	0.195
Lying on the Ground	0.220
Sitting, Leisurely*	0.183
Sitting, Lecture, Etc.*	0.253
Sitting, Riding Bus, Truck	0.245
Sitting, in Bunkers	0.245
Standing Casually Outside*	0.213
Standing Formation	0.356
Walking Normally, Light Activity*	0.530
Walking Normally w/Field Equipment*	0.783
Walking, Forced March w/Field Equipment	0.969
Marching	0.705
Run, Double Time	2.656
Running	5.514
Personal Toilet (Washing, Shaving)	0.278
Dressing, Etc.	0.466
Getting Equipment (Labor Detail, Light)	0.410
Moving Equipment, Labor Detail, Moderate	0.703
Cleaning, Etc. (Sweeping Floor, Etc.)	0.535
Cleaning Equipment, Etc.	0.437
Break, Unroll Bedroll, Etc.	0.703
Break, Rollup Bedroll, Etc.	0.703
Policing Area	0.360

Appendix II (cont.)

Foot Inspection	0.245
Standing, Inspection of Equipment, Etc.	0.206
Washing Clothes	0.364
PT Exercise (Calisthenics)	0.814
Rope Climb	1.470
Swimming	5.205
Crawling	0.977
Kneeling	0.175
Hand to Hand Combat (1/2 Resting)	0.977
Bayonet Drill	1.298
Obstacle Course	0.977
Confidence Course*	1.054
Practice, Application Bayonet	0.960
Patrolling in Woods, Etc.	0.954
Kneeling, Crawling, Crouching, Etc.	0.977
Pushups	1.510
Walking, 4.3 mph	0.969
Walking, 2.5 miles in 100 Minutes	0.636
Walking, 120 Paces/Minute w/o Equipment*	1.518
Walking, 120 Paces/Minute w/Equipment*	1.532
Sitting w/Web Equipment*	0.270
Mile Run (6 Min) w/o Web Equipment*	2.400
Army PT Repetitions - 6*	1.517
9*	1.517
Double Time 180 Pace/Minute w/Web Equipment*	2.015
Standing at Ease w/Web Equipment*	0.230
Walking Leisurely w/Web Equipment*	0.753
Walking Leisurely w/Web Equipment and Bedroll*	0.940

* These values performed at Fort Benning, Beorgia. All other values from Consolazio, Pecora and Johnson (1963) (3).

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R&D
(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author)
Bioenergetics Division
US Army Medical Research & Nutrition Laboratory
Fitzsimons GH, Denver, Colorado 80240

2a REPORT SECURITY CLASSIFICATION
UNCLASSIFIED

2b GROUP

3 REPORT TITLE
NUTRITION SURVEY: RANGER DEPARTMENT, FORT BENNING, GEORGIA

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)
Final Report - 27 November - 20 December 1964

5 AUTHOR(S) (Last name, first name, initial)
Consolazio, C. Frank, Matoush, Le Roy O., Richard A. Nelson, Harding, Richard S., and Canham, John E.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
28 January 1966	51	9

8a. CONTRACT OR GRANT NO.

b. PROJECT NO 5028 6.21.56.01.1
Bio-Medical Investigations
c 3A035601A822
Military Internal Medicine
d 02 - Internal Medicine

9a. ORIGINATOR'S REPORT NUMBER(S)
USAMRNL Report No. 291

9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10. AVAILABILITY/LIMITATION NOTICES
All distribution of this report is controlled. Qualified DDC users shall request through USAMRNL, FGH, Denver, Colorado 80240.

11. SUPPLEMENTARY NOTES

12. SPONSORING MILITARY ACTIVITY
US Army Medical Research & Development Command, Washington, D. C. 20315

13. ABSTRACT
AR 40-5 prescribes the minimal nutrient intake of a physically active individual living in a temperate environment and subsisting on a garrison or field type ration to be 3600 Calories/man/day. The daily food consumption of the Ranger Department trainees, Fort Benning, Georgia, over the entire training period, using the chemical analyses of the food composites averaged 4404 Calories or an increase of 22.2% over the daily prescribed intakes. When one utilizes the caloric equivalent of the body weight change (-70 gm/man/day or 442 Calories) the energy requirements averaged 4846 Calories/man/day. This was equivalent to an increase of 34.5% over the prescribed daily minimal intakes.

This fairly high requirement was not unexpected since the men worked long hours, especially during the field training phase, and were under stress imposed by continuous physical and mental harassment.

DD FORM 1 JAN 64 1473

UNCLASSIFIED
Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Nutrition Surveys						
Food Intake, Military						
Energy Requirements						
Heavy Physical Activity Requirements						

INSTRUCTIONS

1. ORIGINATING ACTIVITY: Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization *(corporate author)* issuing the report.

2a. REPORT SECURITY CLASSIFICATION: Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.

2b. GROUP: Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.

3. REPORT TITLE: Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title

4. DESCRIPTIVE NOTES: If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.

5. AUTHOR(S): Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.

6. REPORT DATE: Enter the date of the report as day, month, year; or month, year. If more than one date appears on the report, use date of publication.

7a. TOTAL NUMBER OF PAGES: The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7b. NUMBER OF REFERENCES: Enter the total number of references cited in the report.

8a. CONTRACT OR GRANT NUMBER: If appropriate, enter the applicable number of the contract or grant under which the report was written.

8b, 8c, & 8d. PROJECT NUMBER: Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

9a. ORIGINATOR'S REPORT NUMBER(S): Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9b. OTHER REPORT NUMBER(S): If the report has been assigned any other report numbers *(either by the originator or by the sponsor)*, also enter this number(s).

10. AVAILABILITY/LIMITATION NOTICES: Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:

(1) "Qualified requesters may obtain copies of this report from DDC."

(2) "Foreign announcement and dissemination of this report by DDC is not authorized."

(3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through

_____."

(4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through

_____."

(5) "All distribution of this report is controlled. Qualified DDC users shall request through

_____."

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

11. SUPPLEMENTARY NOTES: Use for additional explanatory notes.

12. SPONSORING MILITARY ACTIVITY: Enter the name of the departmental project office or laboratory sponsoring *(paying for)* the research and development. Include address.

13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as *(TS)*, *(S)*, *(C)*, or *(U)*.

There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

14. KEY WORDS: Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, rules, and weights is optional.

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author) Bioenergetics Division US Army Medical Research & Nutrition Laboratory Fitzsimons GH, Denver, Colorado 80240	2a REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b GROUP

3 REPORT TITLE

NUTRITION SURVEY: RANGER DEPARTMENT, FORT BENNING, GEORGIA

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report - 27 November - 20 December 1964

5 AUTHOR(S) (Last name, first name, initial)

Consolazio, C. Frank, Matoush, Le Roy O., Richard A. Nelson, Harding, Richard S., and Canham, John E.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
28 January 1966	51	9

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO. 5028 6.21.56.01.1 Bio-Medical Investigations c 3A035601A822 Military Internal Medicine d 02 - Internal Medicine	USAMRNL Report No. 291
	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10. AVAILABILITY/LIMITATION NOTICES

All distribution of this report is controlled. Qualified DDC users shall request through USAMRNL, FGH, Denver, Colorado 80240.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	US Army Medical Research & Development Command, Washington, D. C. 20315

13. ABSTRACT

AR 40-5 prescribes the minimal nutrient intake of a physically active individual living in a temperate environment and subsisting on a garrison or field type ration to be 3600 Calories/man/day. The daily food consumption of the Ranger Department trainees, Fort Benning, Georgia, over the entire training period, using the chemical analyses of the food composites averaged 4404 Calories or an increase of 22.2% over the daily prescribed intakes. When one utilizes the caloric equivalent of the body weight change (-70 gm/man/day or 442 Calories) the energy requirements averaged 4846 Calories/man/day. This was equivalent to an increase of 34.5% over the prescribed daily minimal intakes.

This fairly high requirement was not unexpected since the men worked long hours, especially during the field training phase, and were under stress imposed by continuous physical and mental harassment.

DD FORM 1 JAN 64 1473

UNCLASSIFIED
Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Nutrition Surveys						
Food Intake, Military						
Energy Requirements						
Heavy Physical Activity Requirements						

INSTRUCTIONS

1. ORIGINATING ACTIVITY: Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization *(corporate author)* issuing the report.

2a. REPORT SECURITY CLASSIFICATION: Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.

2b. GROUP: Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.

3. REPORT TITLE: Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.

4. DESCRIPTIVE NOTES: If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.

5. AUTHOR(S): Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.

6. REPORT DATE: Enter the date of the report as day, month, year; or month, year. If more than one date appears on the report, use date of publication.

7a. TOTAL NUMBER OF PAGES: The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7b. NUMBER OF REFERENCES: Enter the total number of references cited in the report.

8a. CONTRACT OR GRANT NUMBER: If appropriate, enter the applicable number of the contract or grant under which the report was written.

8b, 8c, & 8d. PROJECT NUMBER: Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

9a. ORIGINATOR'S REPORT NUMBER(S): Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9b. OTHER REPORT NUMBER(S): If the report has been assigned any other report numbers *(either by the originator or by the sponsor)*, also enter this number(s).

10. AVAILABILITY/LIMITATION NOTICES: Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:

(1) "Qualified requesters may obtain copies of this report from DDC."

(2) "Foreign announcement and dissemination of this report by DDC is not authorized."

(3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through _____."

(4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through _____."

(5) "All distribution of this report is controlled. Qualified DDC users shall request through _____."

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

11. SUPPLEMENTARY NOTES: Use for additional explanatory notes.

12. SPONSORING MILITARY ACTIVITY: Enter the name of the departmental project office or laboratory sponsoring *(paying for)* the research and development. Include address.

13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as *(TS)*, *(S)*, *(C)*, or *(U)*.

There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

14. KEY WORDS: Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, rules, and weights is optional.

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author) Bioenergetics Division US Army Medical Research & Nutrition Laboratory Fitzsimons GH, Denver, Colorado 80240	2a REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b GROUP

3 REPORT TITLE

NUTRITION SURVEY: RANGER DEPARTMENT, FORT BENNING, GEORGIA

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report - 27 November - 20 December 1964

5 AUTHOR(S) (Last name, first name, initial)

Consolazio, C. Frank, Matoush, Le Roy O., Richard A. Nelson, Harding, Richard S., and Canham, John E.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
28 January 1966	51	9

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO. 5028 6.21.56.01.1 Bio-Medical Investigations c 3A035601A822 Military Internal Medicine d 02 - Internal Medicine	USAMRNL Report No. 291
	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10. AVAILABILITY/LIMITATION NOTICES

All distribution of this report is controlled. Qualified DDC users shall request through USAMRNL, FGH, Denver, Colorado 80240.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	US Army Medical Research & Development Command, Washington, D. C. 20315

13. ABSTRACT

AR 40-5 prescribes the minimal nutrient intake of a physically active individual living in a temperate environment and subsisting on a garrison or field type ration to be 3600 Calories/man/day. The daily food consumption of the Ranger Department trainees, Fort Benning, Georgia, over the entire training period, using the chemical analyses of the food composites averaged 4404 Calories or an increase of 22.2% over the daily prescribed intakes. When one utilizes the caloric equivalent of the body weight change (-70 gm/man/day or 442 Calories) the energy requirements averaged 4846 Calories/man/day. This was equivalent to an increase of 34.5% over the prescribed daily minimal intakes.

This fairly high requirement was not unexpected since the men worked long hours, especially during the field training phase, and were under stress imposed by continuous physical and mental harassment.

DD FORM 1 JAN 64 1473

UNCLASSIFIED
Security Classification

UNCLASSIFIED
Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Nutrition Surveys						
Food Intake, Military						
Energy Requirements						
Heavy Physical Activity Requirements						

INSTRUCTIONS

1. ORIGINATING ACTIVITY: Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization *(corporate author)* issuing the report.

2a. REPORT SECURITY CLASSIFICATION: Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.

2b. GROUP: Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.

3. REPORT TITLE: Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.

4. DESCRIPTIVE NOTES: If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.

5. AUTHOR(S): Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.

6. REPORT DATE: Enter the date of the report as day, month, year; or month, year. If more than one date appears on the report, use date of publication.

7a. TOTAL NUMBER OF PAGES: The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7b. NUMBER OF REFERENCES: Enter the total number of references cited in the report.

8a. CONTRACT OR GRANT NUMBER: If appropriate, enter the applicable number of the contract or grant under which the report was written.

8b, 8c, & 8d. PROJECT NUMBER: Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

9a. ORIGINATOR'S REPORT NUMBER(S): Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9b. OTHER REPORT NUMBER(S): If the report has been assigned any other report numbers *(either by the originator or by the sponsor)*, also enter this number(s).

10. AVAILABILITY/LIMITATION NOTICES: Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:

(1) "Qualified requesters may obtain copies of this report from DDC."

(2) "Foreign announcement and dissemination of this report by DDC is not authorized."

(3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through _____."

(4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through _____."

(5) "All distribution of this report is controlled. Qualified DDC users shall request through _____."

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

11. SUPPLEMENTARY NOTES: Use for additional explanatory notes.

12. SPONSORING MILITARY ACTIVITY: Enter the name of the departmental project office or laboratory sponsoring *(paying for)* the research and development. Include address.

13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as *(TS)*, *(S)*, *(C)*, or *(U)*.

There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

14. KEY WORDS: Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, rules, and weights is optional.

UNCLASSIFIED
Security Classification

SUPPLEMENTARY

INFORMATION

NOTICES OF CHANGES IN CLASSIFICATION, DISTRIBUTION AND AVAILABILITY

69-17 1 SEPTEMBER 1969

AD-478 391L Army Medical Research and Nutrition Lab., Denver, Colo. Final rept. 27 Nov-20 Dec 64. Rept. no. 291 28 Jan 66	Controlled: all requests to Army Medical Research and Nutrition Lab., Denver, Colo.	No limitation	USAMRNL ltr, 25 Jun 69